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A PLEA FOR AN ENGINEER CORPS IN THE NAVY.

BY REAR-ADMIRAL S. B. LUCE, U. S. N.

WHATEVER may be the final outcome of the trial, the disaster which recently befell the U. S. S. "Bennington" has brought before the public the question, whether or not a man can master two professions—whether one can become a good officer of the military marine, and, at the same time, a good Marine Engineer. The compound "military marine" is used here instead of the word "Navy" designedly. As a Navy is created and maintained solely with a view to the preservation of peace, or the possible contingency of war, all the operations of a fleet partake of a military character; hence, we have the expression "military marine." A Navy is simply a sea-army. It is clear, therefore, that the education and training of officers of the military marine must partake very largely of a military character. This view has not always prevailed. In former days to say of a naval officer that he was a thorough seaman was to accord to him the highest professional praise. During the Revolutionary War, some of the most successful officers of the merchant service became privateersmen, and numbers of successful privateersmen entered the Navy. They were thorough seamen and owed their success to their superior seamanship. Seamanship was the *sine qua non* of professional attainments. Ordnance and gunnery were in a very crude stage of development. Marine International Law was a sealed book. Nautical Astronomy had been but little studied. Longitude was determined by measuring lunar distances. The laws of storms and the physical geography of the sea were unheard of. The same conditions prevailed to a greater or less extent during the War of 1812, and for a number of succeeding years. Seamanship was the great desideratum; for seamanship won battles! Gunnery was an all-important factor, it is true. But what did good gunnery avail if the broadsides were not placed in a position to do the greatest execution? Just there came in the skill of the seaman. It was to handle his ship in such a manner that the fire of all his guns might be most effective. What was true of single-ship actions was true in a larger sense of the great fleet fights. Other things being equal, victory inclined to the ablest seaman. Thus it came that the seaman and seamanship so dominated the nautical mind that the military character of the profession was lost sight of. So much so, indeed, that the sailor affected contempt for a soldier. The scale of a sailor's individual preferences was: "A messmate before a topmate, a topmate before a shipmate, a shipmate before a dog, and a dog before a soldier." Hence it was that, during the sail period of naval history, the thorough seaman was a past master in all that related to the motive power of his ship.

But it would be an error to argue from this that a naval officer always has been, and, hence, always should be, a master of the motive power of his ship. It was not so during the galley period of naval history, nor is it true of the steam period. In the early days of the galley period, when the Greek penteconter—an open boat pulling fifty oars—was the highest type of war-vessel, the fighting-men were the oarsmen; that is to say, the men who did the fighting supplied the motive power. It was the same during the sail period: the sailors did the fighting and regulated the motive power—the sails of the ship actuated by the wind. But, when the bireme of two banks, and the trireme with its three banks of oars, came into use, there gradually sprang up two distinct classes—the rowers and the fighting-men—the men whose special province it was to furnish the motive power; and another, and a distinct, class whose province it was to do the fighting. The fighting-men had their own officers, the rowers theirs. Each class, from the highest to the lowest, was homogeneous. This distribution of duties was one not simply of man's device; it was an imperative necessity imposed by existing conditions. The steam period has revived that practice, the practice of having a just and proper division of duties—those whose business it is to do the fighting and those who are responsible for the motive power. A want of homogeneity in the personnel of either class would be detrimental to the well-being of the whole, for if the personnel is not congruous, then it is not sympathetic, having no community of feeling in its several parts, which would be fatal to the efficiency of the whole. Specifically, to have one part of the personnel of a corps of marine engineers to be made up of combatants, and another part to be made up of non-combatants, is contrary to the teaching of history and of every-day experience. This brings us to the consideration of a term which has obtained some vogue of late—" a fighting-engineer."

A fighting-engineer, one would naturally suppose, was a graduate of a military academy, who had been assigned to the Engineer Corps of the Army. General McClellan was a notable example of a fighting-engineer. He graduated from West Point into the Engineer Corps of the Army, fought with distinction in the Mexican War, and subsequently was in chief command of the Army of the Potomac in the Civil War. He was in truth a " fighting-engineer ": a military, not a mechanical, engineer. Applying the term to the Navy reveals some of the curiosities of our naval methods. By the Act of July 4th, 1864, Congress authorized the Secretary of the Navy to provide for the educating of marine engineers at the Naval Academy. As a consequence, Cadet Engineers were obliged to devote a portion of their time to military exercises and seamanship, time which had formerly been given to the machine-shop. This Act was followed by the Act of August 5th, 1882, which abolished the distinction between Cadet Midshipmen and Cadet Engineers; and provided that *all* undergraduates should be classed as Naval Cadets; and that, thereafter, all vacancies in the lower grades of the Engineer Corps should be filled from the graduates of the Naval Academy. This was the first step in the scheme of amalgamation. As a logical sequence of these measures came the Personnel Act, Section 1, transferring the officers of the Engineer Corps to the line of the Navy. Thus the Engineer Corps became extinct. As a corps it no longer exists. The Corps ceased to exist by merging the marine engineers into the military branch of the naval service. The members of the Corps had been trained both as combatants and as marine engineers—the course of training prescribed for all undergraduates. Hence the term " fighting-engineer " is the equivalent of the term " naval officer " of the line. In practice, however, we find that, by a process of natural selection, certain graduates elected to become marine engineers. It is the latter to whom the term fighting-engineer properly applies, if to any one. Hence the expression a fighting-engineer contains, in a condensed form, a very interesting episode in our naval history. Examined critically, as an abstract question, we find that the compound fighting-engineer is a cross between the military and the mechanical. Professionally, he is a hybrid. The chief characteristic of hybridism is sterility. Sterility is opposed to reproduction or development. That is what the expression "fighting-engineer" stands for—sterility. The fighting-engineer is, professionally, unfruitful, unprofitable. He may do moderately well in either capacity, but he can never excel in the one or in the other. He is of the "Jack of all trades but master of none" class. He represents mediocrity, the commonplace, the barely respectable. His normal condition is static, as opposed to the dynamics of singleness of aim. Now, excellence in each department of the naval service is what modern education requires, and what war demands. The question to be considered, therefore, is how far the hybrid is to meet the demands of war. It is not only a practical, but a very serious question, and one demanding an intelligent and an immediate answer.

In discussing a question of such importance to the Navy, we disclaim any intention whatever of reflecting upon individuals or classes. We gladly admit the brilliant exceptions to our hypothesis furnished by the very able line officers who have done so much to render the amalgamation scheme a success. We are dealing with rules of general application, not with the exceptions, however notable.

The case may be summed up somewhat as follows: The tactics of the fleet is dependent upon the tactics of the battle-ship. The tactics of the battle-ship is dependent upon its motive power; the motive power is dependent upon the engineer's force; and the engineer's force, in turn, is dependent upon the officers who have immediate charge of it and are responsible for its efficiency. Hence, from a *strictly military* point of view, the proficiency of the engineer officer is a question of vital importance to the naval tactician, as well as to the naval administrator. He cannot afford to have any but the very best the country can produce—the very best as to professional attainments and manual skill in his own special calling.

Our convictions on this very important question have been confirmed and strengthened by an article which appeared in this REVIEW in March, 1902, entitled "Some Neglected Naval Lessons of the War." It is the strongest argument that has come to our notice, showing the *military* necessity, to the Navy, of a thoroughly trained engineer's force. The "Oregon's" performance during the Spanish War is cited, on the one hand, by way of example of what good marine engineering work, under a capable captain, can accomplish; and the Spanish ships at Santiago, on the other hand, to show how poor engineering may easily result in the loss of a battle. The writer well says: "The great lesson to be drawn from the Battle of Santiago is the vital importance of engineering to the efficiency of the modern fleet." His plea for the engineer corps is ably presented. He strengthens his position by adducing an English authority of recognized ability. The Editor of the London "Engineering" for November 15th, 1901, whom the author speaks of as a "clear-headed student of naval affairs," says:

> "Engineering is not to be learned without practical object-lessons carried out by the student himself. No man can become a mechanical engineer without dirtying his hands; without devoting to the subject several years of hard study accompanied by practical work. It is a matter of long training, both in theory and practice. No country that cannot command a body of men willing to undergo the disagreeable features, incidental to engineering training, will be able to maintain its position as a first-class naval Power, under the stress of war, however many ships and guns it may possess. Neither Great Britain nor the United States lacks such men, and it will be only the ruling power of either country that will prevent their employment. . . . The chief danger is that the warrant machinists will be accepted as efficient stop-gaps, although we think there is too much engineering knowledge abroad in the United States for the foolishness of that course not to be seen. If, however, such a plan is accepted, the American Navy will be thrown back at least a quarter of a century in its personnel. The old round will be trodden once more; the old fight fought again. In the mean time, the efficiency of the American Navy will suffer; and, if it should be put to the ultimate use for which all navies are supposed to be built (war), a very unpleasant awakening may result."

Says a German authority of acknowledged ability:

> "In order to be competent, nowadays, an engineer must be proficient in the numerous fields of engineering science and practice. It is impossible for the average man to acquire even a sufficient smattering of knowledge in this immense field of learning in the old empirical way. . . . The complexity of modern problems constantly increases the number of subjects which cannot be dealt with in an elementary way. . . . The consequence of the new order of things is that the demand for en-

gineers that have had a thorough theoretical training is constantly increasing."*

These remarks referred principally to civil engineers; but they are just as applicable to marine engineers.

Accepting these views, which fully agree with the views of our own engineering authorities, that to become a marine engineer one "must devote to the subject several years of hard study, accompanied by practical work," and that "it is a matter of long and special training both in theory and practice"; and accepting, too, the opinions of the highest authorities, that to acquire a knowledge of tactics and strategy, and to become proficient in Marine International Law, require much practice for the first, and constant study and reflection for all, let us ask, in all sincerity, if a naval officer is capable of becoming proficient in both professions. Our answer is, most emphatically, that he is not. He cannot serve two masters.

The higher and more thorough education now demanded of every profession has had a marked influence on the Navy. It remains true that a naval officer must be, as of old, a "seaman and a gentleman."† But, in these days, he must be a great deal more than that. He must still be thoroughly familiar with the motive power of his ship. He must be a seaman, not necessarily in the old sense of the word, but in his ability to handle a battleship in a seamanlike manner, under all conditions of wind and weather, and to maintain his exact position, at all times, in the fleet. He must have the "sea-habit," as it is called—the sea-stomach, the sea-legs, the sea-tastes—tastes which make him contented to live on board ship and joy in his duties there. And he must be a gentleman in his broad and liberal education and varied attainments. Besides being a good English scholar, he must be familiar with at least one foreign language.

A glance at the curriculum of the Naval Academy will show how thorough and comprehensive is its course of study. In mathematics, it will compare favorably with our great Universities. As a school of marine engineering for naval officers of the line, it is said to be one of the best in the world. On these and cognate branches, the courses of instruction for the line officer and the marine engineer run on parallel lines, but they soon diverge. Coincidently with the courses in steam-engineering and scholastic studies, run the military training and instruction in seamanship, gunnery, navigation and law. The very first step taken with the midshipman on entering the Naval Academy is to make a soldier of him. It is in the "setting-up drills," the "school of the soldier," the "school of the company," and in the battalion of infantry that he is inducted into military life: the military life whose field of action is on the high seas.

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* "Technical Education in Germany," J. L. Bashford, "The Fortnightly Review," October, 1905.

† "None other than a gentleman, as well as a seaman, . . . is qualified to support the character of a commissioned officer in the navy."—PAUL JONES. "One could not be a good officer without having the knowledge of a practical seaman and the manners of a gentleman."—LORD NELSON.

Of the four years' course 16.9 per cent. is given to instruction in military branches, seamanship and navigation. Our contention is that, for the midshipman destined for duty in the engineering branch of the Navy, not only is this time wasted, but the instruction is positively harmful, inasmuch as it diverts a mind prone to mechanical pursuits into unrelated channels.* There is no affinity between military arts and mechanical arts.

The Naval Academy, after all that can be said of it, is but a preparatory school of war. Our real naval school is now the North Atlantic Fleet.† This school is of such recent growth that

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* *Summary of drill periods during four years' course:*

Seamanship	76	Deviation of compass	3
Boats under oars and sails	52	Great guns	22
Steam tactics	14	Landing force	4
Signals	10	Steam	124
Target practice (great guns)	12	Practical electricity	10
Torpedoes	15	Turrets	5
Practical ordnance	54	General quarters	16
Artillery	24	Clear ship for action	16
Target practice (small arms)	33	Bayonet exercise	2
Company drill	32	Gymnastics	15
Infantry	36	Dancing	16
Sword exercise	33	Setting-up drill	2

Instruction in seamanship and gunnery on board steamers includes instruction in engineering. Instruction in naval tactics includes engineering aboard steam-launches when practicable. Are all these drills necessary to one who is to manage the engineering department of our battle-ships, to overhaul and repair the machinery, and, ultimately, to design the engines of the navy? For one aspiring to honors in engineering science 78 per cent. of these drills should be dispensed with.

† Writing on board the "Constitution," Boston, Nov. 26th, 1814, Commodore Charles Stewart said: "With respect to a naval academy, the best school for the instruction of youth in the profession is the deck of a ship, presuming that none would be received into the service as midshipmen whose education had not been such as to fit them for officers, and calculated for gentlemen." This is measurably true to-day.

its great importance is hardly yet appreciated. It is in this school that the junior officer learns the duties of Watch and Division officer. The latter prepares himself for the responsible duties of captain of a battle-ship, and the latter, in turn, for the higher and more responsible duties of flag-officer; while the whole course of training qualifies an officer for the still higher and yet more comprehensive duties of naval administrator. We look forward, by the way, to the time when we shall have an Admiralty Staff on which a Secretary of the Navy may lean with confidence—a Staff composed chiefly of flag-officers who have commanded fleets or squadrons. We may add, parenthetically, that no officer should be advanced to flag rank who has not commanded a "first-rate" for at least two years.

The foundation so well laid at the Naval Academy should be sedulously built upon by a progressive course of self-culture;* following one undeviating line until the rôle of the officer of the military marine merges into that of statecraft. "The world knows that Lord Nelson can fight the battles of his country; but a constant and confidential correspondence with this great man for a considerable portion of time has taught me that he is not less capable of providing for its political interests and honor on occasions of great delicacy and embarrassment."† This indicates a habit of long and continuous pondering on international affairs. "He was the most original tactician of the day," said Admiral Lord Hood of Nelson when he was only twenty-four. Nelson's successes were the net results of steadfastness and singleness of purpose carried on through his whole life. "From his youth up, Togo's life has been devoted exclusively to the study and practice of the art of national defence," says Adachi Kinnosuké. He was a specialist. On the same lines Farragut and Porter were specialists. Each one, beginning his career during early boyhood—one might say childhood—these paladins of the sea gave their best thoughts and energies to their profession—the art of war.

From these general remarks the deduction is plain. He who aspires to flag rank, with its wide range of duties and grave responsibilities, must estimate at the start the relative values of the different branches that lead to preferment. It will be found that, important as it is, steam-engineering is a subsidiary branch: while he who aspires to the front rank of engineering science cannot afford to waste his time in studies and exercises that have no bearing on the profession of engineer. If he would be a worthy successor of the very able engineers who built up our steam Navy, he must adopt, as they did, the principle of concentration on the profession of their choice. Differentiation should begin at fourteen. Before there can be a rational curriculum, says Herbert Spencer, we must settle which things it most concerns us to know —" We must determine the *relative values* of knowledges."

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* "Humanity has progressed solely by self-instruction."—HERBERT SPENCER.

† Speech of Lord Minto in the House of Lords, on hearing of the victory of the Nile.

Admirable as the course of studies and exercises at the Naval Academy is, one would scarcely call it a " rational curriculum " for a School of Marine Engineers.

The specialty of the line officer is the art of war. His tastes may, and often do, lead him to specialize in other directions. The Navy can point with pride to the Washington Navy-Yard and to Indian Head for the evidences of the successful achievements of its own officers, from the designing of heavy ordnance to the turning out, and proving, of the finished product. Ordnance, as a science, and the art of gunnery, another specialization, are essentially of a military character. The same cannot be predicated of marine engineering. Specialization is now the rule in every profession save that of the engineer of the United States Navy. The wonderful advances made of late years in every department of science is due to the specialist. Specialization, be it observed, is only another form of concentration, and concentration is one of the soundest of military principles. It was concentration, as opposed to the dispersion of the forces of his adversary, that gave Togo his first great advantage during the war just concluded. The same principle is of general application. In every calling, those who have been successful are those who have concentrated their powers on one fixed object. Unity of purpose insures success. To these accepted tenets Congress has made the Navy an exception. But the fiat engineer will be found irredeemable in the sterling worth of engineering science.

Would the " fighting-engineer " be permitted in the engine-rooms of the great trans-Atlantic liners? Hardly. Those lines are conducted on business principles. They want there, and will have, real engineers, marine engineers, to run the engines of those great ships—engineers who know their business and take pride in it. Those companies demand the real thing without any frills. And that is just what the Navy demands—*bona fide* Marine Engineers. The stern exactions of war will no more permit dilettanteism in the engine-room than on the bridge.

The objection urged against the reestablishment of the Engineer Corps is that it would only result in reviving the old "line-and-staff" fight, now so happily ended. The answer to that objection is, that experience has taught us that the "line-and-staff" fight was brought about mainly through the mistake of forty years ago, in giving our marine engineers a military training at the Naval Academy. If we repeat that mistake the results would, naturally, be the same; and we should have another "line-and-staff" fight and another amalgamation act. There can be no two opinions upon that question. But if, warned by the experience of the past, we have the wisdom to educate Cadet Engineers at some great engineering centre, as for example at the New York Navy-Yard or at League Island, where engineering work in the machine-shop could go hand-in-hand with theoretical studies, we should, in time, raise a class of marine engineers who would enter that corps through choice. Their tastes, their aptitude for that particular kind of work, would have led them there and would keep them there. They would become wedded to that profession and would not be divorced from it. The school of marine engineering might very well be modelled after the Naval Academy, as far as admission of candidates and rules and regulations are concerned. But its curriculum should be arranged with a special view to suit a technical school of that character.

With such a course of education, we would in time have a corps of scientific and thoroughly practical marine engineers, of which the Navy and the country might well be proud. Officers of that corps should have all the rank, pay and privileges that could reasonably be asked for.

The abolition of the Corps of Engineers has had one good result. It has given to the world a practical demonstration of the excellence of the course of instruction in marine engineering at the Naval Academy, and of the ability of our line officers to take charge of the engineers' department of vessels of war, with marked success, but this must not blind us to their true vocation as heirs of the Lords of the Deep.

S. B. LUCE.